

## **Supplementary materials for**

# **Syntrophic interaction of sulfate-reducing bacteria and hydro-gen-producing acetogen stimulated methane production from waste activated sludge digestion**

Haokun Wu <sup>1</sup>, Aijuan Zhou <sup>1, 6, \*</sup>, Yanqing Duan<sup>2, \*</sup>, Zhihong Liu <sup>1</sup>, Zhangwei He <sup>3, 4</sup>,  
Wenzong Liu <sup>5</sup> and Xiuping Yue <sup>1, 6</sup>

<sup>1</sup> College of Environmental Science and Engineering, Taiyuan University of Technology, Taiyuan 030024, China

<sup>2</sup> Department of Environmental and Safety Engineering, Taiyuan Institute of Technology, Taiyuan 030008, China

<sup>3</sup> Key Laboratory of Northwest Water Resource, Environment and Ecology, Ministry of Education, Xi'an University of Architecture and Technology, Xi'an 710055, China

<sup>4</sup> Shanxi Key Laboratory of Environmental Engineering, School of Environmental and Municipal Engineering, Xi'an University of Architecture and Technology, Xi'an 710055, China

<sup>5</sup> School of Civil and Environmental Engineering, Harbin Institute of Technology Shenzhen, Shenzhen 518055, China

<sup>6</sup> Shanxi Engineer Research Institute of Sludge Disposition and Resources, Taiyuan University of Technology, Taiyuan 030024, China

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Supporting figures (Figure S1, S2, S3, S4)

**Table S1** Effects on particle size of WAS

Group No.	Name	D10	D50	D90
1	Control	8.20	31.01	95.78
2	H-S-W <sub>50</sub>	7.92	30.08	93.24
3	H-S-W <sub>100</sub>	7.66	29.34	86.50
4	H-S-W <sub>200</sub>	7.86	29.77	86.80
5	H-S-W <sub>400</sub>	7.64	29.82	86.85

**Table S2** Major topological properties of the empirical network and its associated random network during WAS anaerobic fermentation.

Microbiome	Empirical networks					
	Network size	Links	Averaged connectivity	Averaged path length	Averaged clustering coefficient	Modularity (fast greedy)
Fermentative consortia	69	134	3.884	4.810	0.317	0.349

**Table S3** Economic analysis of SCFAs and CH<sub>4</sub> recovery

		Equivalent chemical amount <sup>b</sup> (ton/d)		Equivalent economic benefit <sup>c</sup> (CNY/d)		Note
		Control	H-S-W <sub>50</sub>	Control	H-S-W <sub>50</sub>	
Reduced commercial chemical production by utilizing SCFAs as alternative carbon source in WWTPs <sup>a</sup>	methanol	2.60	3.65	6068.9	8497.3	<a href="http://www.jiachunwang.com/quote/">http://www.jiachunwang.com/quote/</a> ; <a href="https://www.100pipi.com/mprice/plist-1-866-1.html">https://www.100pipi.com/mprice/plist-1-866-1.html</a>
	sodium acetate	5.01	7.01	11771.2	16481.3	
	glucose	3.66	5.13	10618.9	14867.9	
Equivalent energy production		2264.10	2637.90	1811.3	2110.3	

<sup>a</sup> The average sludge yields was set as 1.62 ton dry matter per 10,000 cubic metre based on sludge yields of 106 typical wastewater treatment plants in 11 cities in key river basins in China [1].

<sup>b</sup> Equivalent chemical amount was evaluated with 70% of the SCFAs yields multiply by the corresponding COD equivalent, 1.5 g COD/g methanol, 0.78 g COD/g sodium acetate and 1.067 g COD/g glucose was used.

<sup>c</sup> Economic benefits was evaluated based on the current market price of the commercial chemicals, 2330 CNY/ton methanol, 2350 CNY/ton sodium acetate and 2900 CNY/ton glucose was used.

<sup>d</sup> Equivalent energy production was calculated based on the equation S1 as follows:  $E = Q_{CH_4} \zeta \eta$  where  $E$  was the energy (kJ);  $Q_{CH_4}$  was methane production (m<sup>3</sup>/d);  $\zeta$  was lower heating value of methane (35800 kJ/m<sup>3</sup>CH<sub>4</sub>);  $\eta$  was energy conversion efficiency, 70%.

<sup>e</sup> Economic benefit was based on commercial and industrial electricity charges of 0.8 CNY/kWh.

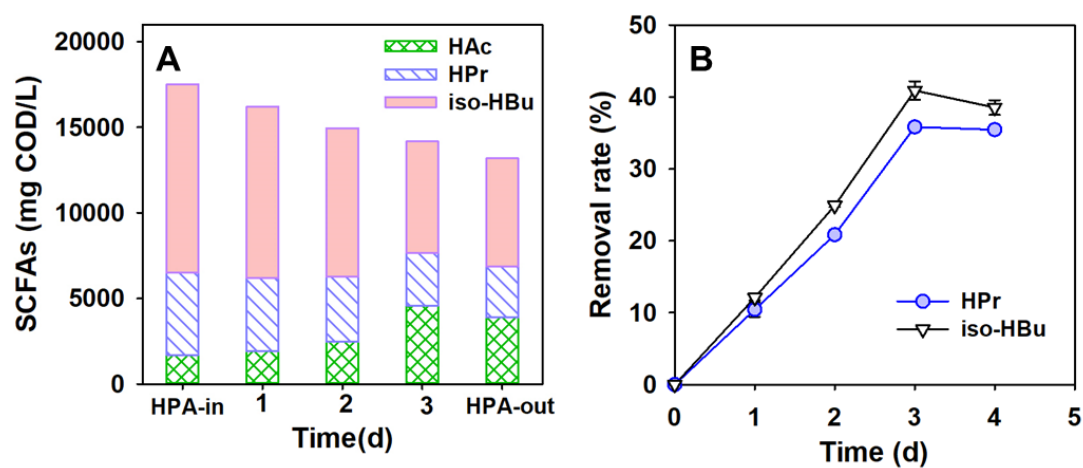


Figure S1 Utilization of SCFAs (A) and removal rate (B) by HPA in domestication.

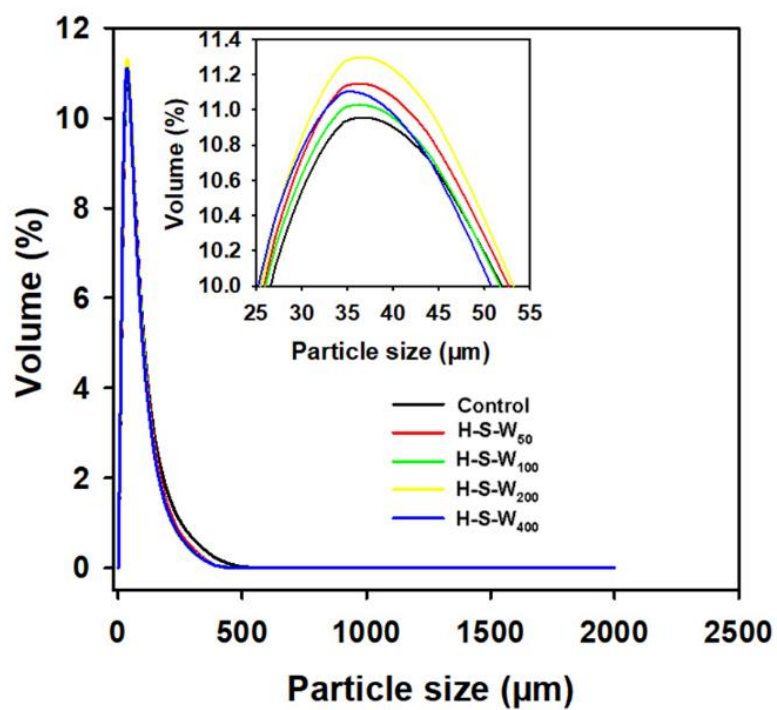


Figure S2 Effect on particle size distribution of sludge.

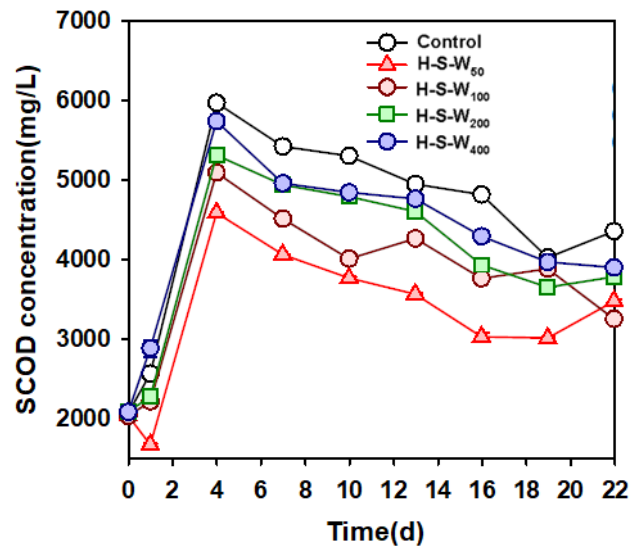


Figure S3 Changes of SCOD in anaerobic digestion of excess sludge under different control systems.

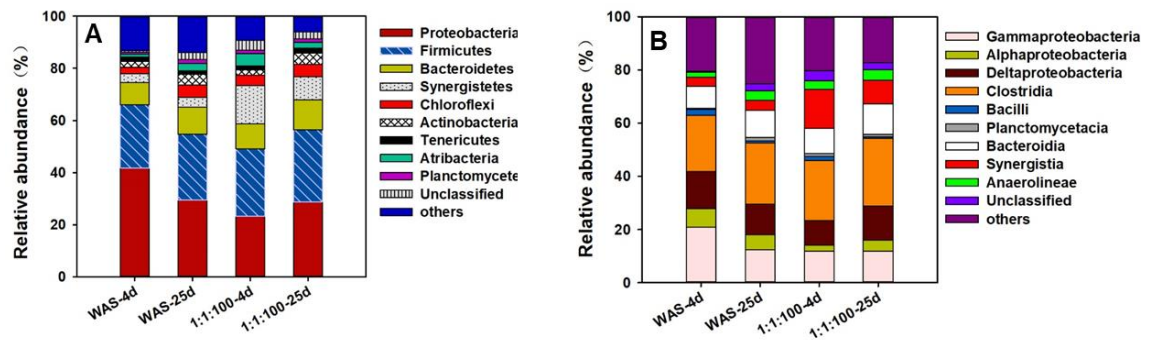


Figure S4 Taxonomic classification of pyrosequences at the phylum (A) and class (B) levels.

## **Reference**

Wang Lei. Investigation on the sludge yield of municipal wastewater treatment plants in key watershed of China[J]. China water & Wastewater, 2018, 34(14): 23-27 (in Chinese).